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Author(s): Halvard Buhaug and Scott Gates

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The Geography of Civil War*

HALVARD BUHAUG

Department of Sociology and Political Science, Norwegian University of Science & Technology (NTNU) & International Peace Research Institute, Oslo (PRIO)

SCOTT GATES

Department of Political Science, Michigan State University & International Peace Research Institute, Oslo (PRIO)

Geographical factors play a critical role in determining how a civil war is fought and who will prevail. Drawing on the PRIO/Uppsala Armed Conflict dataset covering the period 1946–2000, the authors have determined the location of all battle-zones for all civil wars in this time period, thereby identifying the geographic extent and the center point of each conflict. Using ordinary least squares (OLS) and three-stage least squares (3SLS) estimation techniques, factors are analyzed that determine the scope of the conflict (area of the conflict zone) and the location of the conflict relative to the capital. It is found that in addition to geographical factors such as the total land area of the country, scope is strongly shaped by such factors as the adjacencies of a border of a neighboring country, the incidence of natural resources in the conflict zone, and the duration of the conflict. The distance of the conflict zone from the capital is influenced by the scope of the conflict, the size of the country, whether or not the objective of the rebels is to secede, and whether or not the rebel group has a religious or ethnic identity. Also, evidence is found of an endogenous relationship between scope and location.

When I took a decision, or adopted an alternative, it was after studying every relevant . . . factor. Geography, tribal structure, religion, social customs, language, appetites, standards – all were at my finger-ends.

T. E. Lawrence, *Letter to B. H. Liddell Hart, June 1933* (Collins, 1998: 3)

Introduction

Lawrence of Arabia's observation is as true today as it was in his time. In recent years, our theoretical and empirical understanding of the factors identified by Lawrence as related to the onset and duration of civil war

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has progressed tremendously.[1] Yet, despite important insights gained from this research, we have very little systematic knowledge about the actual fighting of civil wars. Ironically, one reason for the general lack of understanding in this regard is that there is little or no actual fighting or war in these models of war onset or duration. There are no battles, no deaths, no weapons, no guerrilla tactics, and no counter-insurgency activities. Territory and resources are never lost or gained. There are no victories and there are no defeats. Yet, motivations regarding peace and war are clearly linked to the prospects of winning or losing a civil war. In addition to securing wealth through the capture of resources, civil wars are often fought over a political objective – control over the apparatus of the state or the creation of a new sovereign state. Clearly, different objectives will alter the way a civil war is fought. A war over control of the state will fundamentally differ from a war of secession. Military historians and strategists have long understood how geographical factors play a critical role in influencing how a civil war is fought and who will prevail. Taking military history as a departure point, this paper examines how strategic objectives and geographical factors affect the location, relative to the capital, and scope (measured conflict area) of armed civil conflict.

Geographic Factors and Armed Civil Conflict

Physical Geographical Factors

The earliest military strategists understood the role of geography and conflict. In his *Discoursi*, Machiavelli (1517/1988: 52–53) wrote that a soldier must become 'familiar with the terrain: how mountains rise, how the valleys open out and plains spread out, as well as with the characteristics of rivers and swamps'. Keegan (1993) in his *History of Warfare* features the role of geographic variables and distinguishes between 'permanently operating' and 'contingent' factors. Permanent factors include terrain and climate. These factors have long been the focus of military tacticians and military historians.[2] And presumably because such stories are more interesting, the majority of such studies have featured the catastrophic blunders caused by commanders ignoring geography, including the likes of Major General George McClellan at Antietem (1862), General Baron Levin Bennigsen at Friedland (1807), General Ludwig Benedek at Könnigratz (1866), and Lieutenant General Mark Clark at Rapido in the Battle for Italy (1944). In contrast, gifted generals, of course, consistently have taken such factors into account and, where possible, have used them to their advantage.

Keegan's second concept, contingent geographic factors, relates to the constraints on logistics and intelligence. To ignore these factors is to ignore Clausewitz's admonition, 'the end for which a soldier is recruited, clothed, armed and trained, the whole object of his sleeping, eating, drinking, and marching is *simply that he should fight at the right place and the right time*' (Murray, 1999: 210). Geography is not just important on the battlefield, but at the operational level as well. With ruinous results, such renowned military minds as Napoleon and the *Oberkommando des Heeres* (OKH) of Nazi Germany neglected these factors in their attempts to conquer Russia and the Soviet Union respectively. It seems that social scientists too, in their analyses of civil war, also have tended to ignore the role of

[1] The other articles included in the special issue serve as testimony to the tremendous strides we have made in understanding the onset and nature of civil war in recent years. See Sambanis (2002) and Gates (2001) for reviews of the literature.

[2] In addition to Keegan (1993), see Collins (1998) and Murray (1999) for discussions regarding the role of geography in warfare.

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geographic variables with regard to the fighting of civil war.

Influenced by classical theorists, most applications of geography to war have been geo-political analyses applied to military strategy or global security issues. The basic premise though almost seems too obvious – that the location and size of a country affect the design and nature of military strategy. Mackinder (1904) speaks of the pivot area, or heartland, while Ratzel (1896) draws on Darwin's survival of the fittest when arguing for a 'law' of territorial growth.[3] For the most part, geopolitical strategic analysis has been global in perspective, applied to explain the international politics of Germany, Great Britain, and the United States. Yet, even for civil war, such factors as the size of a country, its location, and the nature of its borders are extremely important, influencing temporal and spatial domain as well as the potentiality for diffusion.

Empirical studies addressing the geographic aspect of conflicts typically consist of statistical, nation/dyadic-level analyses regarding interstate war, and rest on different measures of proximity of states (Bremer, 1992; Diehl, 1991; Gleditsch, 1995; Vasquez, 1995). Following Boulding (1962), Sprout & Sprout (1965), and Richardson (1960), geography is treated primarily as a concept of contiguity and distance, affecting interstate interaction. These studies have demonstrated that inter-capital distance and number of borders are essential predictors of conflict proneness. However, such measures are less interesting when studying internal conflicts.

When it comes to exploring determinants of the *location* of conflicts, little or no systematic effort has been made. Attributes of the conflict-ridden countries (topography, climate, population) as well as characteristics of the conflicts (severity, duration, goal of rebel group) have only to a limited extent been included in quantitative conflict studies, and always as exogenous factors affecting outbreak or duration. Fearon & Laitin (1999) and Collier & Hoeffler (2001) both include crude measures of mountainous terrain and forest cover as predictors of onset of conflict. And in an effort to determine relevant South American dyads, Lemke (1995) acknowledges the relevance of terrain by constructing a time–distance measure of interstate transportation cost.

[3] For more modern literature of this nature, see Pepper & Jenkins (1985) and Kliot & Waterman (1991).

Natural Resources

Recent work on the economics of civil war clearly demonstrates that to understand civil war today we need to understand the role played by natural resources in financing the purchase of arms. Theoretical studies such as Addison, Le Billon & Murshed (2000) push our theoretical understanding of the role of resources with regard to conflict (particularly as a source of loot to finance a war), while empirical studies by Auty (1998), Collier & Hoeffler (2001), de Soysa (2000), Ross (2001) and others provide evidence of the wide array of problems associated with resource abundance. Resource extraction is for the most part spatially fixed. Businesses engaged in such activities cannot choose where the natural resources are located, and, unlike enterprises in other types of economic activity, they cannot relocate. As a business, you must decide not to invest or to disengage. To sustain access to the resources and protect their investments, natural resource extraction businesses generally rely on paying 'whoever is in power' (Le Billon, 2001: 569). This makes natural resources extremely amenable to taxing and to looting.

Natural resources differ a great deal with regard to their concentration.[4] Point

[4] The distinction between point and diffuse resources in Addison, Le Billon & Murshed (2000), Addison & Murshed (2001), and Auty (2001) lies not in their geographic dispersion, but the fact that point-sourced resource rents are concentrated and capturable. We, like Le Billon (2001), feature the geographic characteristics.

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resources tend to characterize oil-drilling operations and pit mining. Illegal drugs (cocaine, hash, heroin, etc.), timber resources, and alluvial diamond mining are more widely dispersed and are therefore more difficult for a government to control. Alluvial diamonds in particular, regarded as the ultimate loot, have served to finance civil wars in Sierra Leone, Angola, Liberia, and the Democratic Republic of Congo. Timber and drugs, too, have financed many rebel groups. Timber has played a big role in financing the conflicts in Myanmar, Cambodia, Liberia, and the Philippines, while drugs have financed conflicts in Afghanistan, the Caucasus, Colombia, Kurdistan, and Tajikistan (Le Billon, 2001: 573).

Geographical location and the concentration of the resources are critical with regard to the opportunities of belligerents to seize or retain control of the resource revenues (Addison & Murshed, 2001; Auty, 1998; Le Billon, 2001). One crucial aspect of location is the proximity to the decision-making center. Natural resources located closer to a country's capital should be easier for the state to control (Le Billon, 2001). Poor data on location and significance have so far prevented scholars from including natural resources in cross-national conflict studies.

The Human Geography of Identity

A substantial number of today's civil wars are related to identity; i.e. they are fought between different ethnic or religious groups. As a consequence, there is a widely held belief that ethnic (and religious) diversity causes conflicts. Reality may not be so simple. Ethnic composition may be operationalized along two dimensions. The first dimension is fragmentation: the more groups, or the higher the probability that two individuals drawn at random are from different groups, the higher the level of fragmentation. There is a consensus that this is negatively related to conflict risk if related at all (Collier & Hoeffler, 2001; Fearon & Laitin, 1999). The other dimension is polarization or dominance. As defined by Collier & Hoeffler, dominance occurs if the largest ethnic group constitutes 45–90% of the population. There is a broad consensus that this variable is positively related to conflict (Collier & Hoeffler, 2001; Elbadawi & Sambanis, 2002; Ellingsen, 2000; Hegre et al., 2001; Reynal-Querol, 2002). Also, Collier & Hoeffler argue that ethnic and religious diversity within a region reduces the opportunity for rapid rebel recruitment.[5] They find that minorities that have a rural base are far more likely to see large-scale ethnic violence than urban and widely dispersed minorities. Accordingly, separatist wars typically emerge where the ethnic groups are located in clearly defined regions of the states.

As with geographic factors like topography and resources, no study of identity and civil war has been concerned with the physical attributes of the conflict. Whether and how identity-related conflicts differ from non-identity conflicts with respect to location and scope has never been explored. Herein lies a huge challenge.

Hypotheses

Location and scope geographically define the characteristics of a war. Indeed, with regard to the capabilities, limitations, and vulnerabilities of armed forces, 'it seems safe to predict that the pertinence of spatial relationships will remain undiminished indefinitely' (Collins, 1998: 11). As noted by Starr (2001) in his presidential address at the Peace Science Society (International) meetings, absolute and relative space are relevant to the study of conflict.

The objective of this article is to examine factors that determine location and scope of

[5] See Gates (2002) for a related discussion regarding geographical distances, ethnicity, and rebel recruitment.

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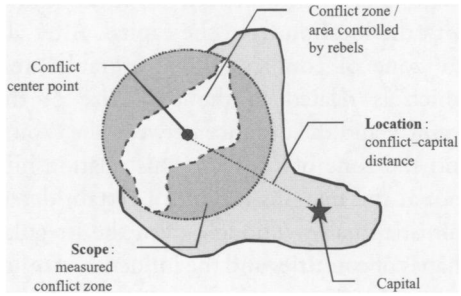
civil wars. This rather unconventional choice of dependent variables contrasts most conflict studies' focus on outbreak, incidence, duration, or ending of war. As a consequence, our findings may not be immediately comparable with other studies on civil war. Having said that, most of our research questions do involve elements of generality too – if physical characteristics of nations, such as size, topography, and natural resources, are found to influence the spatial domain of civil wars, they probably affect the temporal dimension as well. Moreover, future work may involve exploring to what extent our geographic data manage to predict outbreak, duration, and recurrence of civil wars.

A civil war is inherently about armed conflict between the state and an organized rebel group. Hence, a key reference point is the capital of a country; after all, the capital is where the state is based. We can therefore presume that state power is centered at the capital. The other main reference point is the geographic center of the zone of conflict. From these two reference points we define the location of the conflict, measured in terms of the distance between the capital city and the conflict center point (hence we treat location as a relative concept). The other key concept, scope, is defined as the geographic domain of the conflict zone, measured as the circular area centered around the conflict center and covering all significant battle zones (see Figure 1). We discuss the particulars of these operationalizations in the next section.

Figure 1. Defining Location and Scope



Location of Conflict

The distance between the capital of a country and the zone of conflict in a civil war is hypothesized to be related to a number of factors. Two primary explanatory factors are identified, the strategic objective of the rebellion (or the nature of the incompatibility) and whether the rebellion is based around an ethnic or religious identity. These relationships can be expressed in terms of two hypotheses:

H1: Rebel groups that aim to seize power from the state will tend to fight their wars closer to the capital city than secessionist groups, *ceteris paribus*.

H2: Rebel groups with an ethnic/religious identity will tend to fight their wars further away from the capital city than non-identity groups, *ceteris paribus*.

We argue that, by the very nature of secessionism, rebel groups aiming to create a new state will focus their fighting against the state in the territory that they are trying to liberate. Such territory is presumed to be not proximate to the capital, the seat of state power. A similar reasoning applies to ethnic groups engaged in armed rebellion against the state. The presumption is that an ethnic group engaged in armed rebellion against the state will not be the group that is concentrated in the capital. Rather, the identity of aggrieved groups tends to be made with respect to the dominant ethnic groups concentrated in the capital.

We control for two key variables, the size of the country and the scope of the conflict. At the margins, the size of the country will limit the conflict–capital distance. Small countries in armed civil conflict will by their very nature find the location of the conflicts to be nearer the capital than the location of

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conflicts in countries with large areas. The scope is also hypothesized to be associated with the location from the capital. After all, the zone of conflict is a measurable area, which is related to the total size of the country and the distance between the capital and the zone of conflict. This relationship, too, at the margins exhibits a certain deterministic quality. Though given the irregular shapes of countries and the influence of other geographical features, the extent of mathematical determinism is minimal.[6]

Scope of Conflict

The scope of conflict is also hypothesized to be associated with a number of factors. Several explanatory variables are featured, the duration of the conflict, whether the conflict zone abuts an international border, whether a resource is present, as well as the extent of mountainous and forested terrain. These relationships can be expressed in the form of the following hypotheses:

H3: The scope of an armed conflict is positively associated with the duration of a conflict, *ceteris paribus.*

H4: The scope of conflicts that abut an international border will be larger than the scope of those that do not, *ceteris paribus.*

H5: The scope of conflicts with natural resources present will be larger than the scope of those that are without, *ceteris paribus.*

H6: The scope of conflicts in mountainous terrain will be larger than the scope of those that are not, *ceteris paribus.*

H7: The scope of conflicts in forested terrain will be larger than the scope of those that are not, *ceteris paribus.*

Duration is hypothesized to be related to war, given that time increases the possibilities for a rebel army to increase its zone of activity. Also short-lived conflicts, such as a coup d'état, are concentrated in the capital city. Insurgency movements that endure year after year tend to encompass a broad territory.

International borders are hypothesized to be related to the size of a conflict zone because of the value of such borders to a rebel army. Rebels will push to gain access to an international border because neighboring countries often provide a safe refuge away from governmental troops, but also because weapons and natural resources are traded and transported across these borders. Control of international borders thus ensures that the rebel army will fight another day.

Natural resources, whether point or dispersed resources, provide revenue for a rebel army. A rebel army has an interest in expanding its zone of control to capture these resources and thereby derive financial gain from them, regardless of whether secessionism or state power is the ultimate political goal.

Rough terrain is ideal for guerrilla warfare and difficult for a government army to control. Mountain areas, giving advantage to rebel troops, allow the rebels to expand the scope of conflict, whereas forests provide cover, particularly against detection or aerial attack. This aids in the freedom of movement and shipment of arms, thereby associated with a wider zone of conflict.

We control for two variables to account for the scope of conflict, the total size of the country and the location of the conflict relative to the capital. These relationships follow the same pattern as in the location model, except that with scope we are working in two dimensions rather than in

[6] If all countries were circles and if physical geographical factors were uniform, then there might be some utility in deriving such a mathematically deterministic relationship. But given the wide distribution of country shapes and geographical features, this relationship can be modeled probabilistically.

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one. At the limit, the relationships are mathematically deterministic, but given the wide variety of shapes of countries, the relationship remains probabilistic and can be estimated statistically.

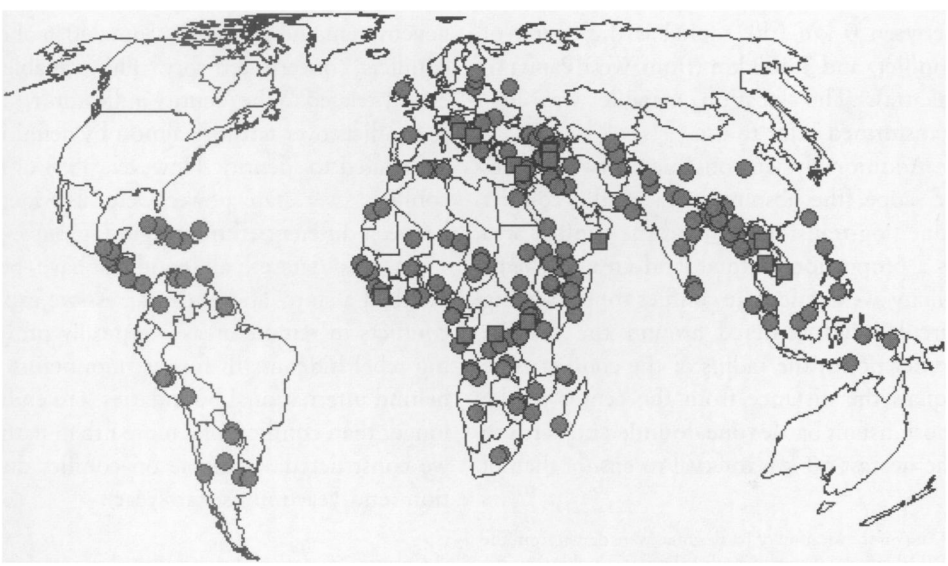
Description of Data

The unit of analysis in our study is armed civil conflicts, as defined by the PRIO/Uppsala Armed Conflict dataset (Gleditsch et al., 2001). However, in this dataset, quite a few intrastate conflicts are subdivided into several separate conflict units, either reflecting varying severity from one year to the next (from 'minor' to 'intermediate' to 'war', or vice versa) or because violence has temporarily decreased below the threshold of conflict (i.e. less than 25 battle-deaths per year).[7] As our analysis is mostly concerned with studying geographic attributes of conflict zones, data on disaggregated conflicts are not necessary. Consequently, the 'subconflicts' were merged if they consisted of identical actors, incompatibility, and geographic location, and less than three years passed from one conflict unit to the next. In total, our dataset includes 265 civil conflicts for the 1946–2000 period. These conflicts are displayed in Figure 2.

Dependent Variables

Our major contribution to this dataset is the inclusion of variables representing location and scope of the conflicts. Quite a few conflicts are limited to one specific place, either a city or an administrative region. These conflicts were assigned conflict center points equaling the geographic coordinates for the specific city/region. As for larger conflicts (in

Figure 2. Civil Conflicts, 1946–2000



Adapted from Gleditsch et al. (2001), using software developed by Jan Ketil Rød. For full details on specific armed conflicts, see the Appendix to that paper.

[7] For example, the conflict in Cabinda between the Angolan government and FLEC (1992–97) is originally coded as three separate conflicts, one in 1992, one in 1994, and one in 1996–97.

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geographical terms), we first identified the major battle zones – i.e. places where the fighting resulted in loss of lives – and areas controlled by rebel groups.[8] The conflict center was then defined as the mid-point of these locations. Determining the center of each conflict is not trivial, since different sources frequently diverge on the exact whereabouts (and severity) of the battles. Moreover, as a number of conflicts are located along dispersed border zones, some conflict centers actually refer to areas quite unaffected by the fighting. Future work on the conflict data will be dedicated to reducing this problem, most likely by utilizing GIS.

Our first dependent variable – the operationalization of location – is measured as the distance from the conflict center to the capital city. The values on this variable were calculated using a geodetic distance calculator, estimating the conflict–capital distances with accuracy far superior to our requirements.[9] The conflict–capital distances vary between 0 km (the capital is the center of conflict) and 3,360 km (from West Papua to Jakarta). The location variable was log-transformed prior to use.

Additionally we constructed two proxies of scope, the absolute area of the conflict zone (log-transformed) and the conflict area as a proportion of total land area. For simplicity, we defined the conflict zones as being circular and centered around the conflict center point; the radius of the conflict zone equals the distance from the center to the most distant battle zone, rounded upwards to the nearest 50-km interval to ensure that all significant battle zones were covered. Conflicts that took place within a single city were assigned a 50-km radius.[10] All estimations reported below were run with logged and unlogged variables. The models estimated with logged variables produced much stronger results.

Explanatory and Instrumental Variables

To control for identity-based conflicts, we constructed a dummy identity variable, given the value 1 if the rebels originate from different ethnic and/or religious groups than the government. The main sources for this variable were the 'wartype' variable of Sambanis (2000)[11] and various volumes of *Keesing's Record of World Events*. According to our data, 59% of the conflicts are related to identity.

Our second explanatory variable is the PRIO/Uppsala dataset's dichotomous incompatibility variable, indicating whether territory (secession) or governance (control over the state) is the incompatibility between the government and the rebels. Some 40% of our conflicts concern territory. This variable is closely related to the identity indicator ($r = .6$), as conflicts over territory almost by definition are related to identity. However, 35% of the conflicts over state power were also fought between different ethnic/religious groups.

In this dataset, all conflicts have been ascribed a start- and end-year. As we expect conflicts in remote areas – typically providing rebel hideouts in forests, mountains, or behind international boundaries – to endure longer than conflicts of a more urban nature, we constructed a variable on conflict duration (end-year minus start-year).

[8] Data on the location of battle zones were drawn from the PRIO/Uppsala Armed Conflict Project's archive at the Department of Peace and Conflict Research, Uppsala University, and various volumes of *Keesing's Record of World Events*.

[9] This program will be made available on the website of the Department of Geomatics at NTNU: http: //www.geomatikk.ntnu.no/prosjektarbeid/geo-hoved98/Applet/b-program.htm.

[10] A negative consequence of the assumed circular shape of the conflict zones is that the measured scope inevitably covers some areas not affected by the conflict, thus overestimating the total area of the civil war. Future work on improving the geographic data will reduce this problem.

[11] Sambanis's (2000) 'wartype' variable is again made up from several sources, most notably Licklider (1995) and the State Failure Project (Esty et al., 1998).

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Table I. Descriptive Statistics

	Observations	*Mean*	*Std. dev.*	*Minimum*	*Maximum*
Location	258	5.23	1.82	1.6	8.1
Absolute scope	258	4.60	1.65	2.3	9.2
Relative scope	246	44.41	38.03	0	100
Land area	251	6.04	1.64	0.7	9.7
Identity	262	0.59	0.49	0	1
Incompatibility	265	1.59	0.49	1	2
Duration	265	5.45	7.93	1	53
Border	258	0.51	0.50	0	1
Resource	262	0.21	0.41	0	1
Mountain	256	23.19	21.78	0	81
Forest	247	30.23	21.56	0	96

In order to control for rebels hiding beyond national borders or conflicts that for other reasons frequently involved neighbor territory, we constructed a dummy indicator on whether or not the conflict zone abuts a border with another country. Roughly one-half (51%) of the conflicts in our sample extend to (or across) the national border of the conflict-ridden country.

Previous conflict studies seem to confirm that primary commodities serve as a major source of rebel finance (Collier & Hoeffler, 2001). Thus we include a dichotomous resource variable, simply indicating whether or not the conflict zone contains essential natural resources such as fossil minerals, metals, or diamonds. This variable was constructed by comparing the scope of the internal conflicts with maps on resource distribution from *Kunnskapsforlagets Store Verdensatlas* (1997), *Oxford Economic Atlas of the World* (1972), as well as descriptive data from the CIA (2001).

Data on country area (log-transformed prior to use) and forests were drawn from World Bank (2000). The forest variable gives the proportion of land area covered by forest, varying between 0 and 96%. We also include a measure of mountainous terrain, identical to Collier & Hoeffler (2001); the values vary between 0 and 94%.[12] Although these measures describe the type of terrain for each country, they do not indicate the extent of mountains and forests specifically for each conflict zone. An important improvement will be to construct these variables from gridded data on topography through the aid of GIS tools, thus facilitating a comparison between the terrain in the conflict zone and the terrain in the rest of the country.

Table I summarizes the descriptive statistics for each of these variables. Table II is the correlation matrix for these variables.

Method of Analysis and Results

OLS Single Equation Models

In order to test our three hypotheses regarding conflict location, we first specify two models to fit the OLS regression of the conflict–capital distance. As Table III demonstrates, both models yield very similar results, and their explanatory powers are very high. Both conflict area (model 1) and conflict area as a proportion of land area (model 2) are important determinants of the conflict location. Accordingly, the more distant the

[12] See Gerrard (2000) for a theoretical discussion of definition and operationalization of the mountainous terrain variable.

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Table II. Correlation Matrix

	Location	Absolute scope	Relative scope	Land area	Identity	Incompatibility	Duration	Border	Resource	Mountain
Absolute scope	.60									
Relative scope	.008	.48								
Land area	.54	.44	–.46							
Identity	.54	.27	–.06	.28						
Incompatibility	–.55	–.09	.31	–.31	–.60					
Duration	.15	.25	.20	.04	.19	–.18				
Border	.35	.33	.17	.12	.32	–.30	.27			
Resource	.11	.27	.10	.14	.05	.16	–.06	–.03		
Mountain	–.006	–.01	.02	–.04	.08	–.10	.07	.06	–.32	
Forest	.09	.10	–.002	.10	–.13	.06	.02	–.12	.12	–.12

conflict centers, the larger the battle-zones – in both relative and absolute terms. Not surprisingly, the conflict location is also positively associated with the size of the country. As noted above, all models were estimated with logged and unlogged distance and area variables. Not only did the logged variables produce higher levels of statistical significance, they also performed better with regard to the diagnostic analyses (omitted variable tests, Cooks' distance, lvr2plots and avplots) that accompanied the OLS estimations (but are not reported here).

According to Hypothesis 1, secessionist conflicts should generally be located further away from the capital city than conflicts over state power. The findings confirm our prediction – the incompatibility variable is statistically very significant in both models. Supporting our second hypothesis, we see that identity is positive and significant regardless of model, although the effect is less impressive than that of the incompatibility variable. This will be more thoroughly discussed in the final section.

Table IV reveals the results from the second part of the OLS regression section, addressing the hypotheses regarding the scope of conflict. As we have two endogenous variables of scope – measuring absolute and relative conflict area respectively – models 3 and 4 generate estimations of absolute scope of conflict, while models 5 and 6 consist of the relative scope of conflict. At first glance, we see that most of the exogenous variables generate very robust results, being significant in all four equations. Moreover, the R^2 are quite high (though not in the league of models 1 and 2).

Hypothesis 3 states that the duration of armed conflict is positively associated with the scope of conflict. This is supported in all four models; the estimate is statistically significant although the coefficient is quite small. We are thus led to the rather intuitive conclusion that longer-lasting conflicts generally involve a larger geographic area. In line with Hypothesis 4 (another seemingly obvious relationship), internal conflicts that abut – or cross – international boundaries are also associated with higher-than-average conflict zones. The impact is

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Table III. OLS Estimation of Location, 1946–2000

Location	*Model 1*	*Model 2*
Absolute scope	0.49	
	(.062)**	
Relative scope		0.02
		(.003)**
Land area	0.21	0.61
	(.065)**	(.058)**
Identity	0.54	0.61
	(.199)**	(.216)**
Incompatibility	−1.27	−1.41
	(.190)**	(.208)**
Constant	3.45	2.65
	(.476)**	(.490)**
N	243	243
R^2	.620	.575

* $p \leq .10$, ** $p \leq .05$, and standard errors are in parentheses.

not overwhelming, but always significant at the 0.10 level. According to Hypothesis 5, the presence of natural resources increases the conflict area. Table IV demonstrates that this clearly is the case; the resource dummy is robust throughout. The only variables that do not fare well in the OLS estimation are the physical geography indicators: mountain and forest. Neither of these had any impact on the scope of conflict, regardless of choice of endogenous variable.[13]

[13] We also found no evidence that population was related to the geography of civil war. Population density, total population, and dispersion of the population (similar to Collier & Hoeffler, 2001) – tested but not reported here – all proved to be insignificant with respect to both scope and location.

Table IV. OLS Estimation of the Absolute (3–4) and Relative (5–6) Scope, 1946–2000

	Model 3 Absolute scope	*Model 4 Absolute scope*	*Model 5 Relative scope*	*Model 6 Relative scope*
Location	0.39	0.38	5.64	5.62
	(.048)**	(.050)**	(1.235)**	(1.299)**
Land area	0.18	0.16	−14.88	−15.14
	(.050)**	(.050)**	(1.226)**	(1.283)**
Duration	0.03	0.03	0.77	0.73
	(.010)**	(.010)**	(.302)**	(.306)**
Border	0.39	0.43	9.49	9.34
	(.192)**	(.204)**	(4.545)**	(4.868)*
Resource	0.83	0.92	17.51	17.47
	(.213)**	(.233)**	(5.533)**	(5.989)**
Mountain		0.004		0.09
		(.004)		(.098)
Forest		0.003		0.06
		(.004)		(.094)
Constant	0.96	0.86	91.62	90.43
	(.271)**	(.295)**	(6.897)**	(8.070)**
N	246	230	246	230
R^2	.466	.474	.374	.375

* $p \leq .10$, ** $p \leq .05$, and standard errors are in parentheses.

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Results of the Three-Stage Least Squares Estimations

In this section, we check for robustness of our results with respect to the endogeneity of area and distance, while examining the relationship between our explanatory variables and the two endogenous variables, scope and location. The distance between the capital city and the center of the conflict zone is highly correlated with the area of the conflict zone (r = 0.602). Accordingly, we assess the estimated effect of the explanatory variables controlling for this relationship between the two endogenous variables.

In order to test this, we have developed a simultaneous equation model, in which the distance between the capital and the center of the conflict zone, the size of the area of the conflict zone (measured both as the natural log of the area and the percentage of the total land area), and the total logged area of the country are endogenized and are explained as a function of exogenous variables, so-called instrumental variables (which are the same as the independent variables reported in our OLS results section). All estimations were undertaken with three-stage least squares (3SLS) in STATA for all variables analyzed in our single equation OLS estimations. Three-stage least squares involve three steps. First, predicted or instrumented values of the endogenous variables (scope and distance) are generated, using all exogenous variables in the system. Second, a cross-equation covariance matrix is estimated. Third, the simultaneous equation with the two endogenized variables is estimated with generalized least squares using the instrumented variables and other exogenous variables, as well as the estimated covariance matrix.[14] The estimation technique 3SLS has the important advantage over two-stage least squares (2SLS) in that it uses the covariance matrix of disturbances, which improves the efficiency of estimation leading to smaller standard errors. However, this improvement depends on the consistency of the covariance matrix estimates, since with 3SLS the misspecification of one equation affects the estimates in all other equations. In sensitivity analysis, we have therefore tested the system of equations with 2SLS instead and found no substantial changes.

Table V reports results for our three-stage least squares simultaneous equation estimations. From the regressions and their associated R^2 values, one can see that our instruments work well in explaining cross-sectional differences in distance (location) and area (scope). For the most part, our results do not vary too much from the single equation OLS results. A simultaneous 3SLS version of each pair of the single equation OLS models was analyzed. We tested four models (models 7–10). Models 7 and 8 produced the best results in terms of overall measures of fit. Models estimated in terms of the relative area of the conflict zone (percentage of total land area in the combat zone) produced markedly worse results than the models in which the actual area of the conflict zone was measured (the natural log of the square kilometers). In terms of the two equations being estimated, the estimation of the distance produced much stronger results than the estimation of the size of the conflict zone. The specific z-scores associated with each coefficient across each model are quite robust. No single estimation challenges our evaluation of each hypothesis.

With regard to Hypothesis 1 (H1), we find strong support. Rebel groups whose objective is to secede from the country do tend to fight further away from the capital than groups intending to take control of the state. The purported objectives of different rebel groups are related to the Uppsala coding of the nature of the incompatibility. We find that

[14] This third stage can also be used to estimate an equation for a specific dependent variable using the instrumented variables, the other exogenous variables and the estimated covariance matrix.

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Table V. Three-Stage Least Squares Estimation of Absolute (7–8) and Relative (9–10) Scope, and Location, 1946–2000

	Model 7 *Absolute scope*	*Model 8* *Absolute scope*	*Model 9* *Relative scope*	*Model 10* *Relative scope*
Scope				
Location	–.13	–.070	–7.55	–9.61
	(.135)	(.125)	(3.190)**	(3.492)**
Land area	.45	.41	–7.84	–6.82
	(.091)**	(.090)**	(2.302)**	(2.360)**
Duration	.040	.037	.95	1.05
	(.012)**	(.012)**	(.295)**	(.302)**
Border	.86	.90	22.18	22.87
	(.231)**	(.236)**	(6.02)**	(5.955)**
Resource	.94	1.02	19.73	19.50
	(.227)**	(.239)**	(6.08)**	(5.816)**
Mountain		.005	.11	
		(.0046)	(.113)	
Forest		.005	.11	
		(.0044)	(.112)	
Constant	1.71	1.31	104.22	114.29
	(.406)**	(.416)**	(10.625)**	(10.549)**
Location				
Absolute scope	.49	.50		
	(.119)**	(.116)**		
Relative scope			.023	.022
			(.0060)**	(.0058)**
Land area	.21	.21	.65	.64
	(.070)**	(.070)**	(.078)**	(.075)**
Identity	.50	.60	.56	.44
	(.206)**	(.216)**	(.230)**	(.216)**
Incompatibility	–1.31	–1.35	–1.63	–1.59
	(.199)**	(.206)**	(.251)**	(.238)**
Constant	3.53	3.47	2.50	2.69
	(.484)**	(.510)**	(.629)**	(.602)**
Scope R^2	.261	.314	.123	.034
Location R^2	.620	.647	.598	.571

* $p \leq .10$, ** $p \leq .05$, and standard errors are in parentheses.

across models, incompatibility is significantly associated with the distance between the capital and the center of the conflict zone. These results reflect what we found with the single equation OLS estimations.

Hypothesis 2 (H2) is also confirmed. Identity-based groups tend to fight their battles further away from the capital than non-identity groups. Across models, this relationship is always statistically significant at $p < .05$, though the effect is not half as strong as for the incompatibility variable – the single strongest predictor of location.

Hypothesis 3 is strongly supported.

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Duration and the size of the conflict zone are positively and statistically significantly associated across models and measurements of the size of the conflict zone. We can conclude that longer-lasting conflicts in general encompass larger areas.

With regard to Hypothesis 4, conflict zones that abut an international border will tend to be larger than conflict zones that do not. This finding is extremely robust. Hypothesis 5 is also strongly supported. The presence of natural resources in the conflict zone is positively and strongly statistically significantly related to the size of the conflict zone across all the models. Hypotheses 6 and 7 are not supported in any of the models.

As for the endogenous effects, we find that when the scope of the conflict is measured as the natural log of the area, distance is statistically significantly related to absolute scope, but absolute scope is not related to distance. When the models are estimated measuring the conflict area as a proportion of the total area of the country (relative scope), the relationship is completely endogenized with both variables associated with one another in the simultaneous estimation. The total land area of the country is also treated endogenously and is entered in both equations. It is robustly statistically significant. As expected, the relationship between the scope of the conflict area and the size of the total area of the country changes with the way in which the battle-zone is measured. If measured in absolute terms, the relationship is positive. The relationship follows from the expectation that larger countries simply have more room within which to fight. The relationship is negative when the size of the battle-zone is measured relatively. As expected, smaller countries tend to have a higher percentage of land involved in conflict. Despite finding support for these endogenized relationships, our conclusions regarding the hypotheses do not change with respect to the results of the single equation OLS estimations and the 3SLS estimations.

Conclusion

To our knowledge, this is the first systematic inquiry into the scope and location of civil conflict. Drawing on the PRIO/Uppsala Armed Conflict dataset for the 1946–2000 period (Gleditsch et al., 2001), we have determined the location of all battle-zones for all conflicts in this time period, thereby identifying the geographic extent and the center point of each conflict. With this data, we are able to analyze the factors that determine the scope and location of civil conflict. Using ordinary least squares (OLS) and three-stage least squares (3SLS) estimation techniques, we have analyzed the factors that determine the scope (measured in terms of logged square kilometers, and as the proportion of a country that is covered by the scope) and the location of the conflict relative to the capital (measured in terms of logged kilometers). Given the interdependence between location and scope, we modeled these relationships as simultaneous equations, which were estimated with 3SLS.

Geographical factors are indeed important. From our analysis, we found that the scope of conflict is associated with such geographical factors as the total land area of the country, whether or not the conflict zone is adjacent to the border of a neighboring country, and whether there are natural resources in the conflict zone. Interestingly, two geographical factors considered to be critical to combat, mountains and forest cover, were found not to be statistically associated with the scope of conflict. This is most likely due to poor data. Our data on mountains and forests pertain to the country as a whole. We do not have precise enough information to inform us as to what extent the zone of conflict is forested or mountainous.

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When military strategists and historians discuss the central role of terrain, they are thinking in terms of specific battles and the specific nature of local geographical features. Our overly general data does not allow us to assess such a specific role.

A non-geographical factor, the duration of the conflict, is also found to be associated with the area of the zone of conflict. Given the lower R^2 values associated with the OLS results and the relevant portion of the 3SLS estimations, it is clear that our findings with respect to the scope of conflict are not as well developed as our understanding of the location of conflict. We consider the primary problem to be related to imprecise measurement. Our method of calculating the area of the zone of conflict imposes a circular measure, where the actual shape is more likely to follow the contours of international boundaries, seashores, rivers, etc. Discontinuous shapes or fragmented zones of conflict, so common in guerrilla warfare, are merely approximated by our measurement technique. By imposing a circular zone of conflict, we in many ways impose a favorable operational structure to the battle area (Collins, 1998: 18). In the future, we hope to improve our measurement of the area of conflict. GIS technology may be useful for improving this measurement.

We are more confident of our results regarding the location of conflict. We have more confidence in how this variable is measured, and our estimations of models with conflict–capital distance as the dependent variable produced much stronger findings. Our OLS and 3SLS results show that the location is influenced by the size of the scope, the size of the country, the nature of the rebellion (whether or not the objective of the rebels is to secede), and whether or not the rebel group has a religious or ethnic identity. The relationships between location and scope and total area of the country are not very surprising. If all countries were the same shape, these relationships would be mathematically deterministic. What is more interesting is that the nature of the rebellion and the nature of the rebel group affect where the conflict will be located. The pattern is quite strong. The nature of the incompatibility (basically the reason for the war) plays the biggest substantive role in determining the location of conflict, far exceeding the effect of other variables. This result indicates that researchers examining other aspects of civil war, such as onset and duration, should be looking at this variable. The strategic objective of the rebel group is important.

We have studied a number of factors that play a role in determining the scope and location of conflict. We have found compelling evidence indicating that many of the factors at T. E. Lawrence's fingertips do indeed affect the nature of conflict. The variables in our analyses relate to most of Lawrence's, including geography (location and scope of conflict, and total land area), tribal structure, religion, language (rebel group identity), and appetites (rebel objective or nature of the incompatibility). The factors that affected the nature of the Arab Revolt in 1916–18 seem to apply to civil wars in general.

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HALVARD BUHAUG, b. 1972, Cand. Polit. (NTNU, 2001); PhD candidate in Political Science, NTNU (2002–). Current main interest: geography and armed conflict.

SCOTT GATES, b. 1957, PhD in Political Science (University of Michigan, 1989); Associate Professor, Michigan State University; Research Professor and Programme Leader, PRIO. Recent articles on civil war have appeared in *Journal of Conflict Resolution* and *American Political Science Review*.

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